

DATE September 28, 1994		
TO M. L. Johnson	DEPT. WRP	BLDG. T130C
FROM L. A. Gregory-Frost	DEPT. EOM/FO	BLDG. 080
		PHONE X8570

ROCKY FLATS PLANT

**MEMORANDA**

"SAY IT IN WRITING"

*L. A. Gregory-Frost*

SUBJECT: HAZARDOUS WASTE DETERMINATION FOR GROUNDWATER DISCHARGED FROM THE 881 FOOTING DRAIN

Ref: Draft Final Water Quality Evaluation of Building 881 Footing Drain Discharge With Recommendation for Discontinued Treatment, Operable Unit No. 1, Interim Measure/Interim Remedial Action" document dated April 1994

At your request, I have evaluated the likelihood that the groundwater, recently pumped from the 881 Footing Drain and discharged to the ground, "contains" hazardous constituents and therefore, once managed, is a RCRA-regulated hazardous waste. The attached pages from the above-referenced report were used to make this determination. The CERCLA-related IRAP ARAR and Potential ARAR comparison was not used in this hazardous waste determination. Information received from Zeke Houk, OU1 Project Manager, indicates that the analytical results from more recent sampling events are consistent with the analytical results from the last quarter of 1993.

As identified on Tables 2-2 and 2-3, acetone, carbon disulfide, carbon tetrachloride, methylene chloride, tetrachloroethene, toluene, 1,1,1-trichloroethane, trichloroethene, xylenes (total) and mercury are constituents which must be evaluated to determine if they are detectable, or are present in concentrations which would result in the groundwater, once managed, being a RCRA-regulated hazardous waste. The text and Figures 2-1, 2-2, 2-3, and 2-8 indicate that the analytical results from samples collected between August and December 1993 were at or below the detection limit or the regulatory concentration limit for these constituents of concern. Therefore, I do not believe that the groundwater is likely to have "contained" listed hazardous constituents, or that the groundwater exhibits any of the characteristics of a RCRA-regulated hazardous waste. Hence, the groundwater, once managed, would not be a RCRA-regulated hazardous waste.

If you have any questions or require additional information, please contact me at extension 8570 or on digital pager 3036.

cc:

L. M. Brooks  
M. C. Broussard  
M. C. Burmeister  
F. M. Durel  
K. G. Peter  
A. L. Primrose  
ERPD Records (2)

DOCUMENT CLASSIFICATION  
REVIEW WAIVER PER  
CLASSIFICATION OFFICE

ADMIN RECCRD  
IA-A-000291

RAV-FAV	TO: M. L. Johnson X5033	FROM: L. A. GREGORY-FROST X8570	DATE: 9/28/94
	FAX #: 5001	FAX #: 8556	PAGES INCLUDING THIS PAGE: 1
		PHONE #: D3036	TOPS 14850

2 limits. Therefore, the unbiased approach to addressing censored data when computing the arithmetic mean is to replace the censored data with one-half the reported detection limit. Also, because the detection limit for an analyte can vary widely in a data set, in order to minimize high-end bias in the computed mean resulting from using one-half the detection limit, censored data with detection limits greater than 2 times the target detection limit reported in the General Radiochemistry and Routine Analytical Services Protocol [GRRASP] [EG&G, 1990]) are ignored in computing the arithmetic mean. Although other more complex methods exist for addressing censored data, the simplicity and robustness of this approach renders it the most common method used. It is the EPA approved method for the background geochemical characterization program at RFP (EG&G, 1992).

### **2.2.1 Volatile Organic Compounds (VOCs)**

The Building 881 footing drain flow has historically exhibited low levels of VOCs. Table 2-2 provides summary statistics for those VOCs detected in the Building 881 footing drain discharge, and highlights those VOCs with greater than 5% exceedance of either the IRAP ARAR or the current potential controlling ARAR. These VOCs are methylene chloride, tetrachloroethene (PCE), and trichloroethene (TCE). The following sections focus on these three compounds. The other VOCs that were detected in the footing drain discharge are near or below the IRAP or current potential ARAR.

#### **2.2.1.1 Methylene Chloride**

Methylene chloride concentrations have exceeded both the IRAP ARAR and the current potential ARAR more than 5% of the time (in this case the two ARARs are approximately the same value [see Table 2-2]). Figure 2-1 illustrates concentration vs. time for the methylene chloride concentration data.

Considering the complete data set, methylene chloride exceeded the ARAR in 17 of the 32 samples. The values ranged from 1 to 28  $\mu\text{g}/\ell$ , and the calculated mean was 5.3  $\mu\text{g}/\ell$ , which is near the ARAR of 5U  $\mu\text{g}/\ell$ . Since all nondetected samples were given a replacement value of one-half the detection limit, the calculated mean may be higher than the true mean. Of the

Table 2-2

## Summary of Detected Volatile Organic Compound (VOCs) Concentrations

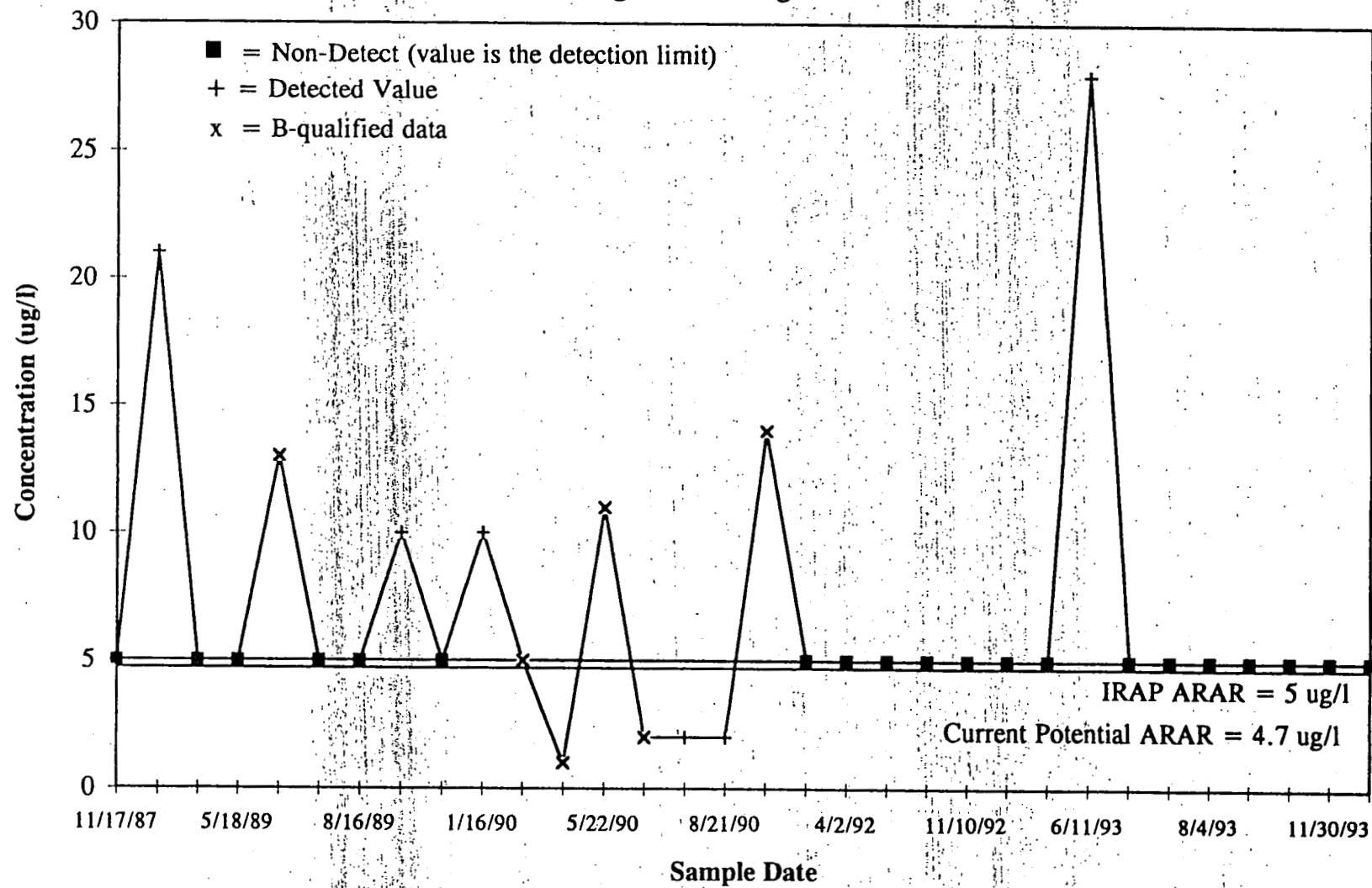
Analyte	#Detect/ #Samples	% Detect	Range ( $\mu\text{g}/\ell$ )		Mean ( $\mu\text{g}/\ell$ )	IRAP		Current Potential ARAR	
			Min	Max		ARAR ( $\mu\text{g}/\ell$ )	# > ARAR	ARAR ( $\mu\text{g}/\ell$ )	# > ARAR
Acetone	7/28	25	2	25	5.9	50	0	NS	NA
Carbon Disulfide	1/33	3	10	10	2.7	5 U	1	NS	NA
Carbon Tetrachloride	1/34	3	6	6	2.6	5U	1	1.0	1
Methylene Chloride	12/32	38	1	28	5.3	5 U	7	4.7	8
Tetrachloroethene	21/34	62	1	128	8.8	5 U	7	1.0	18
Toluene	2/33	6	1	12	2.7	2000	0	1000	0
1,1,1-trichloroethane	1/34	3	5	5	2.6	200	0	200	0
Trichloroethene	5/34	15	1	14	2.9	5	2	2.7	2
Xylenes (total)	1/33	3	2	2	2.5	NS	NA	10000	0

Note: Shading indicates analyte concentrations exceeded that the IRAP ARAR or Current Potential Controlling ARAR at a frequency > 5%.

U = Below Detection Limit  
 NA = Not Applicable  
 NS = Not Specified

Mean has been calculated using 1/2 the detection limit for non-detects. Non-detects with detection limits greater than 2 times the CRDL have not been included in the data set. Rejected data have not been included in the data set.

Figure 2-1  
Methylene Chloride Concentrations Over Time  
Building 881 Footing Drain



data collected after January 1990, methylene chloride was detected in only 1 of 15 samples; the detected value is 28  $\mu\text{g}/\ell$ , and the calculated mean is 4.2  $\mu\text{g}/\ell$ .

Of greatest significance with respect to methylene chloride is that the OU1 RFI/RI (DOE, 1993) determined that methylene chloride is not a contaminant at the 881 Hillside Area, stating the following:

It is a common laboratory contaminant and the majority of detections carry "B-qualifiers" [50% in the case of the footing drain flow]. [This] compound occurred in the background groundwater samples (... in 28% of the samples with a maximum concentration of 25 ppb).... [This compound] occurred in soils and sediment samples in low concentrations throughout OU1 which is not indicative of point source releases.... [The] evidence does not suggest the compound is actually a contaminant at OU1.

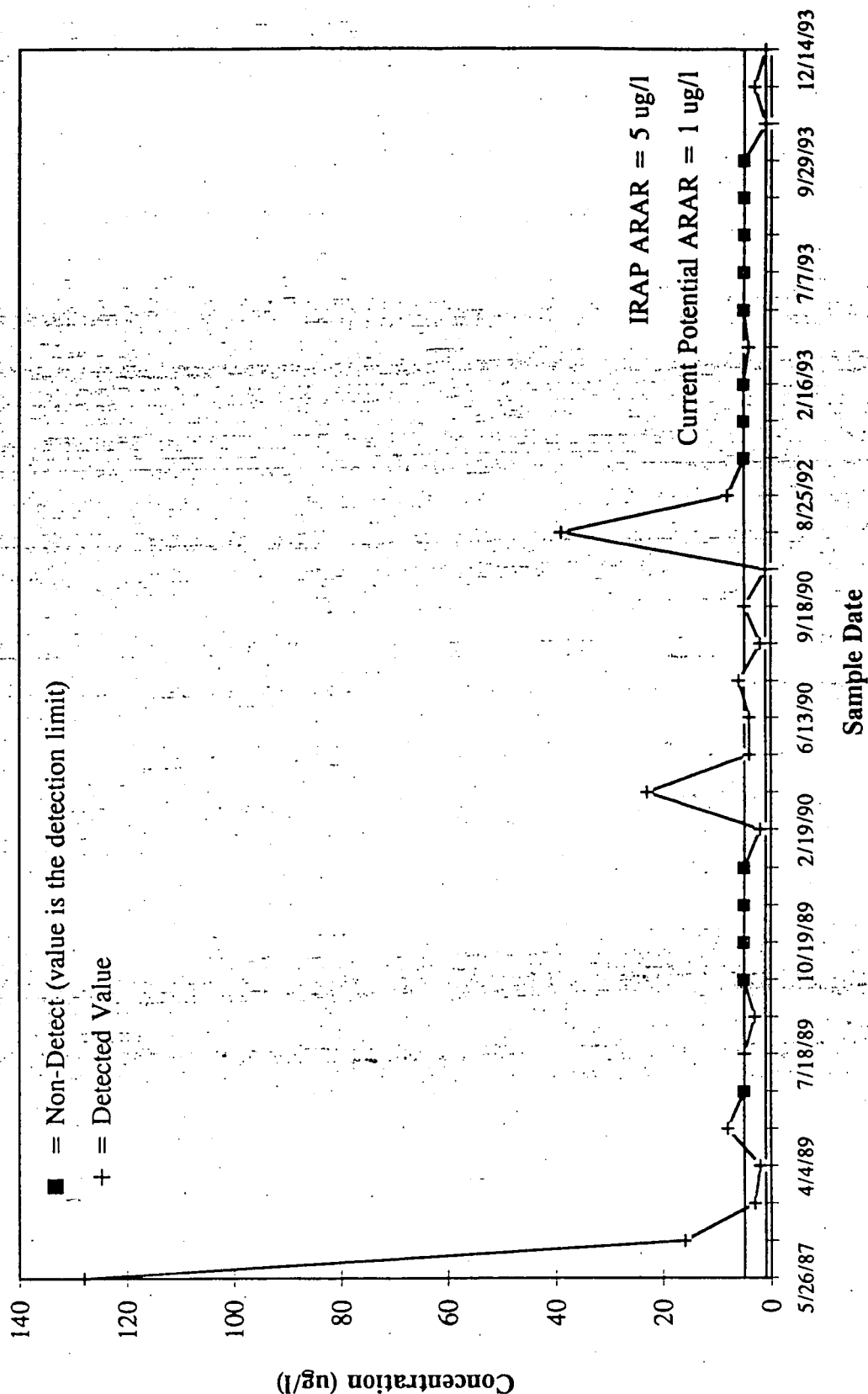
#### 2.2.1.2 Tetrachloroethene (PCE)

PCE concentrations have exceeded both the IRAP ARAR and the current potential ARAR more than 5% of the time. The ARAR for PCE is 5  $\mu\text{g}/\ell$  (current potential ARAR = 1.0  $\mu\text{g}/\ell$ ). Figure 2-2 illustrates concentration vs. time for the PCE data.

Considering the complete data set, PCE exceeded the ARAR in 7 of the 34 (21 of 34) samples. The values ranged from 1 to 128  $\mu\text{g}/\ell$ , and the calculated mean was 8.8  $\mu\text{g}/\ell$ . Of the samples collected after January 1990, PCE exceeded the ARAR in only 2 of the 15 (7 of 15) samples. The values ranged from 1 to 39  $\mu\text{g}/\ell$ , and the calculated mean was only 5.1  $\mu\text{g}/\ell$ . Examination of Figure 2-2 indicates the initial measured PCE concentration of 128  $\mu\text{g}/\ell$  is an outlier, i.e., it is inconsistent with the other data, possibly due to sampling or analytical error.

The IRAP ARAR is equal to the detection limit for gas chromatography/mass spectrometry (GC/MS) analysis of PCE, but the current potential ARAR is the Practical Quantitation Limit (PQL) established by CDH for GC analysis of PCE (the ARAR is actually 0.8  $\mu\text{g}/\ell$ ). In computing the mean, all non-detects were given a replacement value of one-half the detection limit or 2.5  $\mu\text{g}/\ell$ ,

**Figure 2-2**  
**Tetrachloroethene Concentrations Over Time**  
 Building 881 Footing Drain



which is significantly greater than the current potential ARAR. As a result, the true mean may be even lower than the calculated mean.

### 2.2.1.3 Trichloroethene (TCE)

Trichloroethene samples exceed both the IRAP ARAR and the current potential ARAR more than 5% of the time. The ARAR for trichloroethene is 5  $\mu\text{g}/\ell$  (current potential ARAR = 2.7  $\mu\text{g}/\ell$ ). Figure 2-3 illustrates concentration vs. time for the trichloroethene data.

For the complete data set, trichloroethene exceeded the ARAR in only 2 of the 34 samples. The values ranged from 1 to 14  $\mu\text{g}/\ell$ , and the calculated mean was 2.9  $\mu\text{g}/\ell$ . Of the samples analyzed after January 1990, trichloroethene did not exceed ARAR, and the calculated mean (2.5  $\mu\text{g}/\ell$ ) is below ARAR. Like PCE, the first two measured concentrations (pre-1990) appear to be outliers which may be due to sampling or analytical error.

### 2.2.2 Semivolatile Organic Compounds (SVOCs)

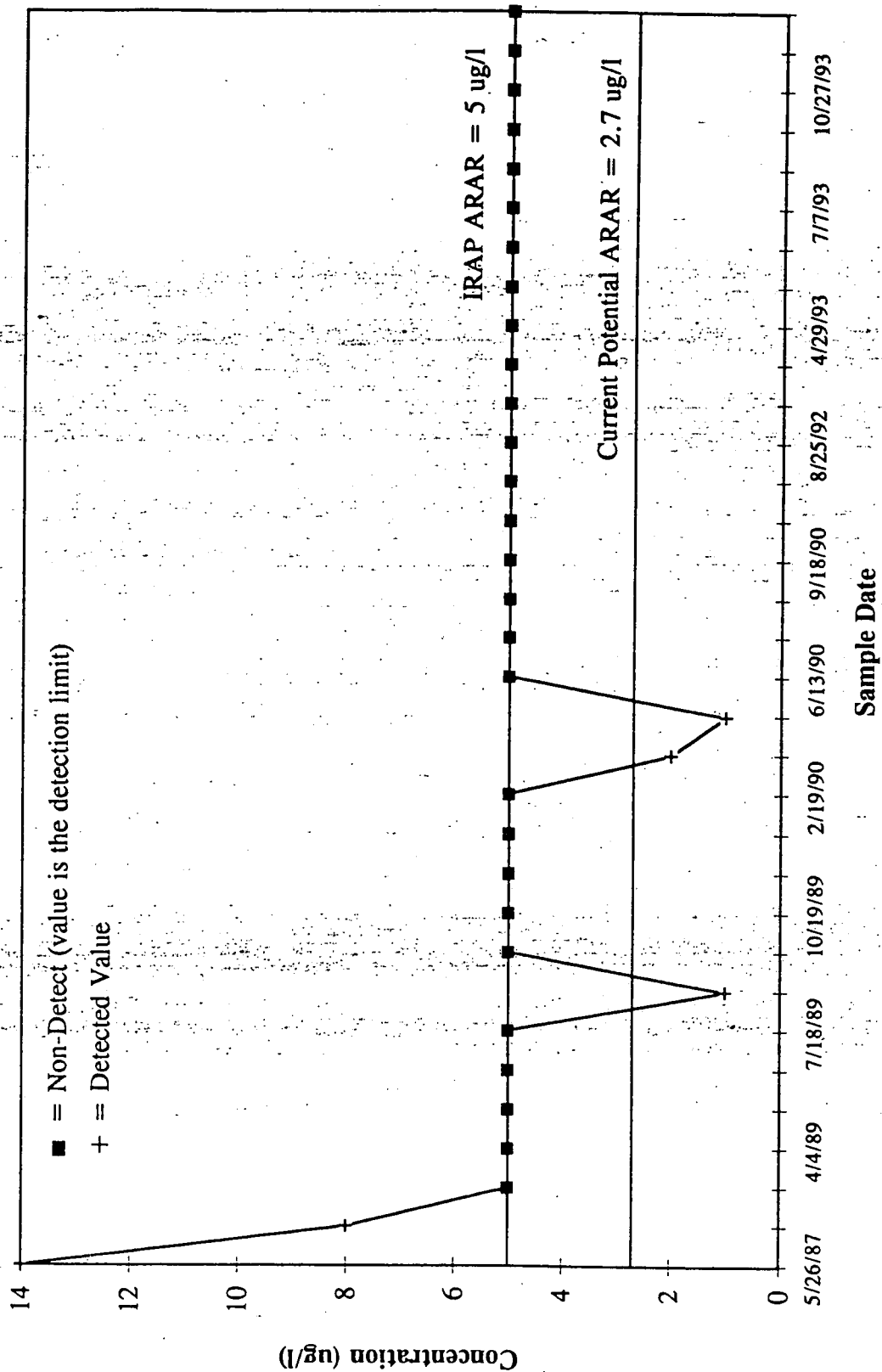
ARARs were not established for SVOCs in the IRAP. However, two of the SVOCs detected at OU1 have current potential ARARs: di-n-butyl phthalate and isophorone. Neither of these compounds was detected above the current potential ARAR.

### 2.2.3 Metals

The Building 881 footing drain has exhibited low metal concentrations. Table 2-3 summarizes the metals concentration data and highlights those metals exceeding the IRAP ARAR or the current potential ARAR with greater than 5%. These metals include aluminum, antimony, cadmium, iron, mercury, silver, and zinc, and are discussed in detail in the following subsections. It is important to note that the results from the OU1 RFI/RI indicate none of these metals are considered containments of OU1 groundwater (DOE, 1993). This calls into question the legitimacy of the basis for the ARARs or the necessity of complying with the ARARs.

7/1/94

**Figure 2-3**  
**Trichloroethene Concentrations Over Time**  
 Building 881 Footing Drain



8/9



Table 2-3

## Summary of Detected Metals Concentrations

Analyte	# Detect/ # Samples	% Detect	Detected ( $\mu\text{g/l}$ )		Mean ( $\mu\text{g/l}$ )	IRAP		Current Potential	
			Min	Max		ARAR ( $\mu\text{g/l}$ )	# > ARAR	ARAR ( $\mu\text{g/l}$ )	# > ARAR
Aluminum	10/30	33	0.6	8750	432	5000	1	87	7
Antimony	2/29	7	21.7	24.4	21	60 U	0	6	2
Arsenic	2/28	7	1	1.8	2.4	50	0	50	0
Barium	18/31	58	0.1	250	118	1000	0	1000	0
Cadmium	2/28	7	2.8	2.8	2.1	10	0	1.21	2
Chromium	3/31	10	3.5	14.6	4	50	0	50	0
Copper	5/31	16	2.6	16	7.2	200	0	12.6	1
Iron	19/31	61	0.15	8910	433	300	5	1000	3
Lead	3/29	10	1.1	14.4	1.8	50	0	4.3	1
Lithium	15/30	50	7.8	31	23.5	2500	0	2500	0
Manganese	13/31	42	1.3	162	11.8	50	1	200	0
Mercury	2/28	7	0.7	700	25.1	2	1	0.01	2
Molybdenum	4/30	13	2.8	9.9	16.7	100U	0	NS	NA
Nickel	3/30	10	4.3	12.2	12.0	200	0	100	0
Selenium	15/30	50	1.3	7.1	2.7	10	0	10	0
Silver	3/28	11	2.3	10.7	3.4	0.50	0	0.36	3
Strontium	23/31	74	0.6	762	585	NS	NA	NS	NA
Vanadium	5/28	18	2.8	24.5	12.2	100	0	100	0
Zinc	31/31	100	0.2	277	59.1	2000	0	113	3

Note: Shading indicates analyte concentrations that exceeded the IRAP ARAR or current potential ARAR at a frequency >5%.

U Below Detection Limit  
NA Not Applicable  
NS Not Specified

Mean has been calculated using 1/2 the detection limit for non-detects. Non-detects with detection limits greater than 2 times the CRDL have not been included in computation of the mean. Rejected data have not been included in the data set.

### 2.2.3.1 Aluminum

Aluminum concentrations exceeded only the current potential ARAR more than 5 % of the time. The current potential ARAR for aluminum is  $87 \mu\text{g}/\ell$ , which is notably lower than the IRAP ARAR of  $5,000 \mu\text{g}/\ell$ . Figure 2-4 illustrates concentration vs. time for the aluminum data. Considering the complete data set, aluminum exceeded the current potential ARAR in 7 of the 30 samples. The values ranged from 0.603 to  $8750 \mu\text{g}/\ell$ , and the calculated mean was  $432 \mu\text{g}/\ell$ . However, of the samples measured after January 1990, aluminum was detected in only 1 of 13 samples; its value was  $13 \mu\text{g}/\ell$  and did not exceed the current potential ARAR.

### 2.2.3.2 Antimony

Antimony concentrations exceeded the current potential ARAR more than 5 % of the time but did not exceed the IRAP ARAR of  $60 \mu\text{g}/\ell$ . The current potential ARAR for antimony is  $6 \mu\text{g}/\ell$ . Figure 2-5 illustrates concentration vs. time for the antimony data.

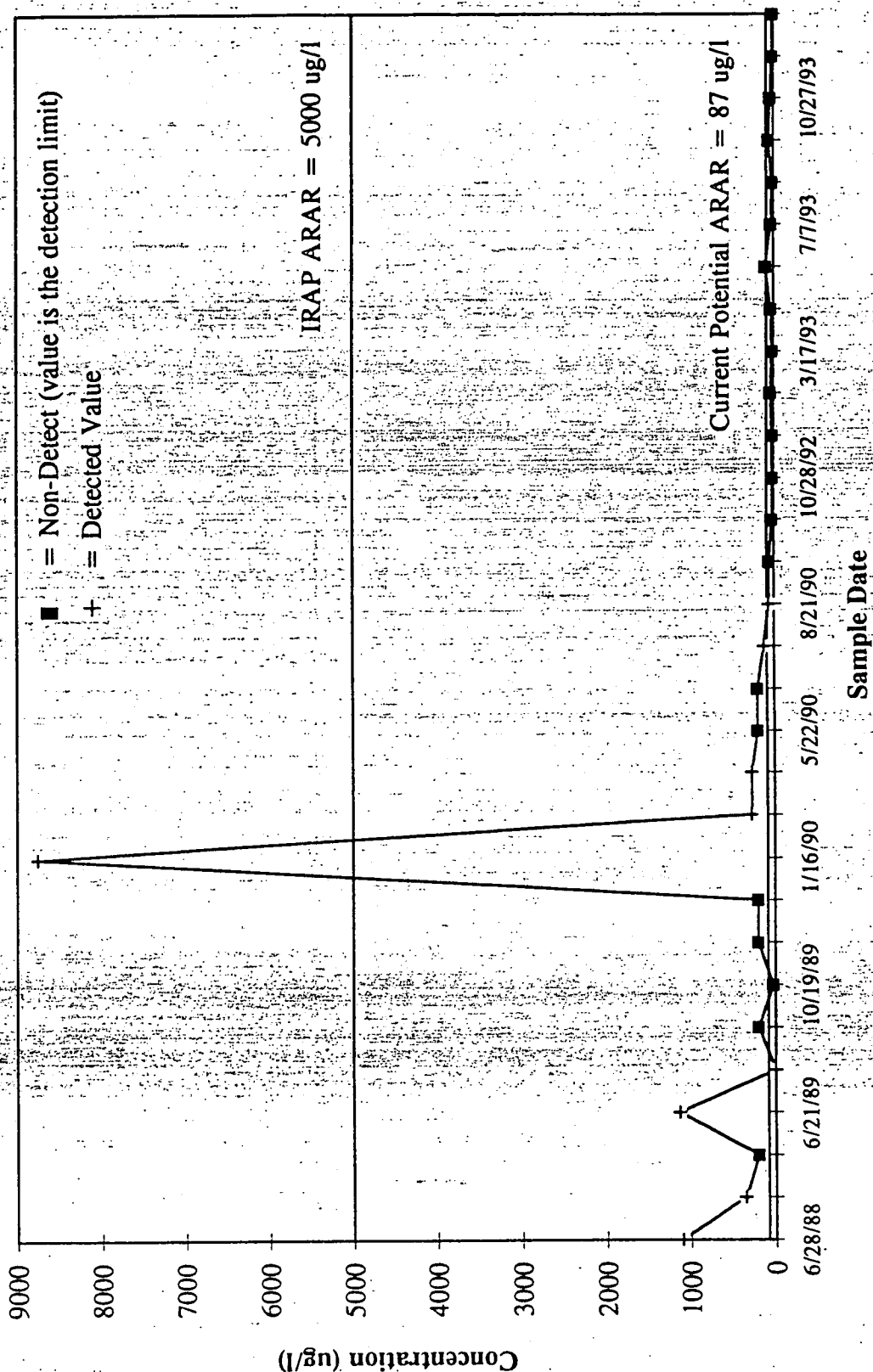
Considering the complete data set, antimony exceeded the current potential ARAR in only 2 of the 29 samples. These are the only two detections in the footing drain flow ( $21.7$  and  $24.4 \mu\text{g}/\ell$ ). The calculated mean is  $21 \mu\text{g}/\ell$ ; however, the true mean may be considerably lower as all non-detects were given a replacement value of one-half the detection limit. The detection limit ranged from 6 to  $60 \mu\text{g}/\ell$  and most of the reported detection limits are at the upper end of this range.

### 2.2.3.3 Cadmium

Cadmium concentrations exceeded the current potential ARAR more than 5 % of the time but did not exceed the IRAP ARAR. The current potential ARAR for cadmium is  $1.21 \mu\text{g}/\ell$  (IRAP ARAR is  $10 \mu\text{g}/\ell$ ). Figure 2-6 illustrates concentration vs. time for the cadmium data.

10/18

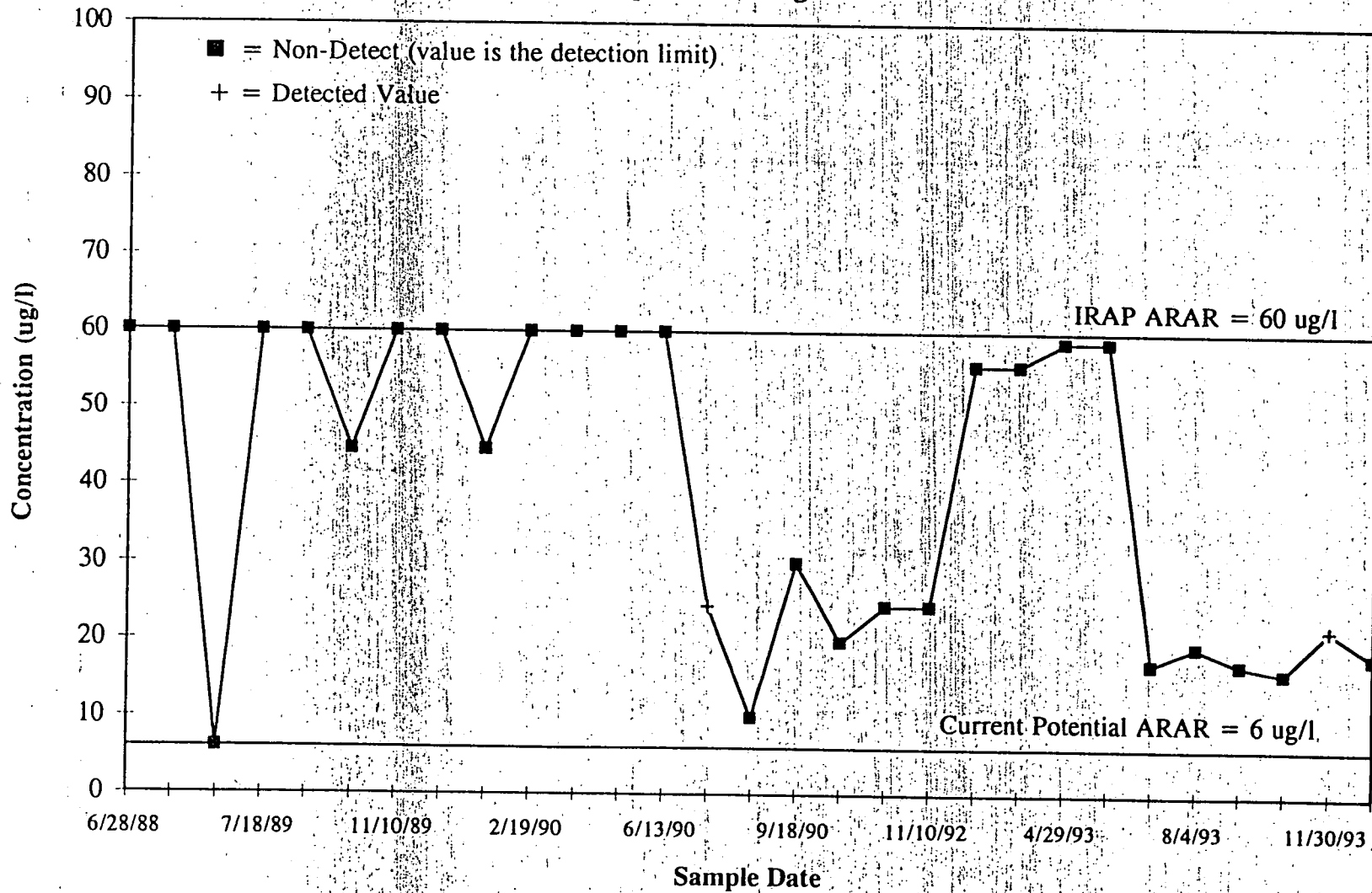
**Figure 2-4**  
**Aluminum Concentrations Over Time**  
 Building 881 Footing Drain



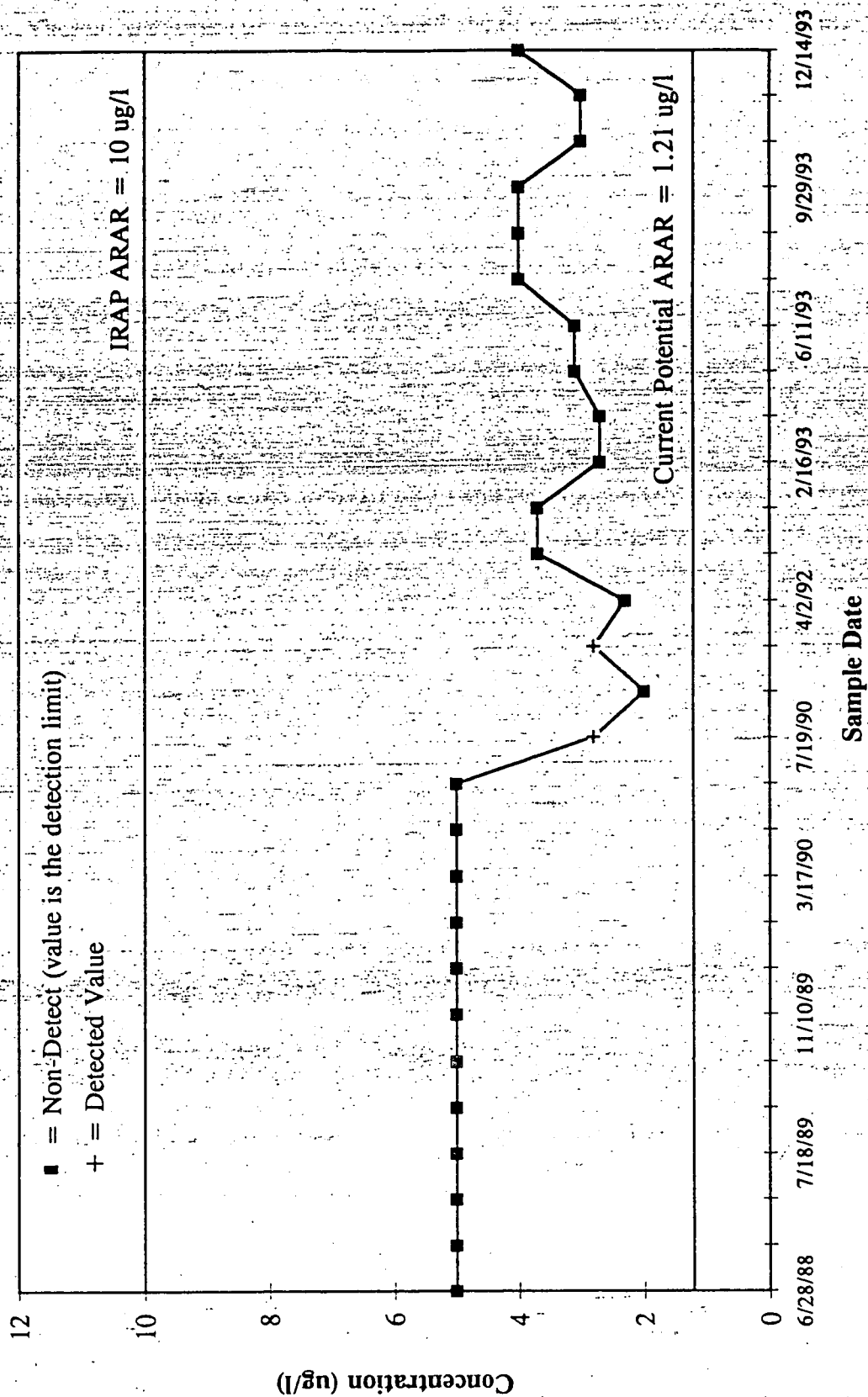
12/14

DRAFT FINAL

Figure 2-5  
Antimony Concentrations Over Time  
Building 881 Footing Drain



**Figure 2-6**  
**Cadmium Concentrations Over Time**  
 Building 881 Footing Drain



13/18

Considering the complete data set, cadmium exceeded the current potential ARAR in only 2 of the 28 samples. These two samples are the only detections of cadmium and were both only 2.8  $\mu\text{g}/\ell$ .

#### 2.2.3.4 Iron

Iron concentrations exceeded both the IRAP ARAR (300  $\mu\text{g}/\ell$ ) and the current potential ARAR (1,000  $\mu\text{g}/\ell$ ) more than 5% of the time. Figure 2-7 illustrates concentration vs. time for the iron data.

Considering the complete data set, iron exceeded the ARAR in only 5 of the 31 (3 of 31) samples. The values ranged from 0.145 to 8910  $\mu\text{g}/\ell$ , and the calculated mean was 433  $\mu\text{g}/\ell$ . The 8,910  $\mu\text{g}/\ell$  value appears to be an outlier (Figure 2-7) as the other data are all near or below ARAR.

#### 2.2.3.5 Mercury

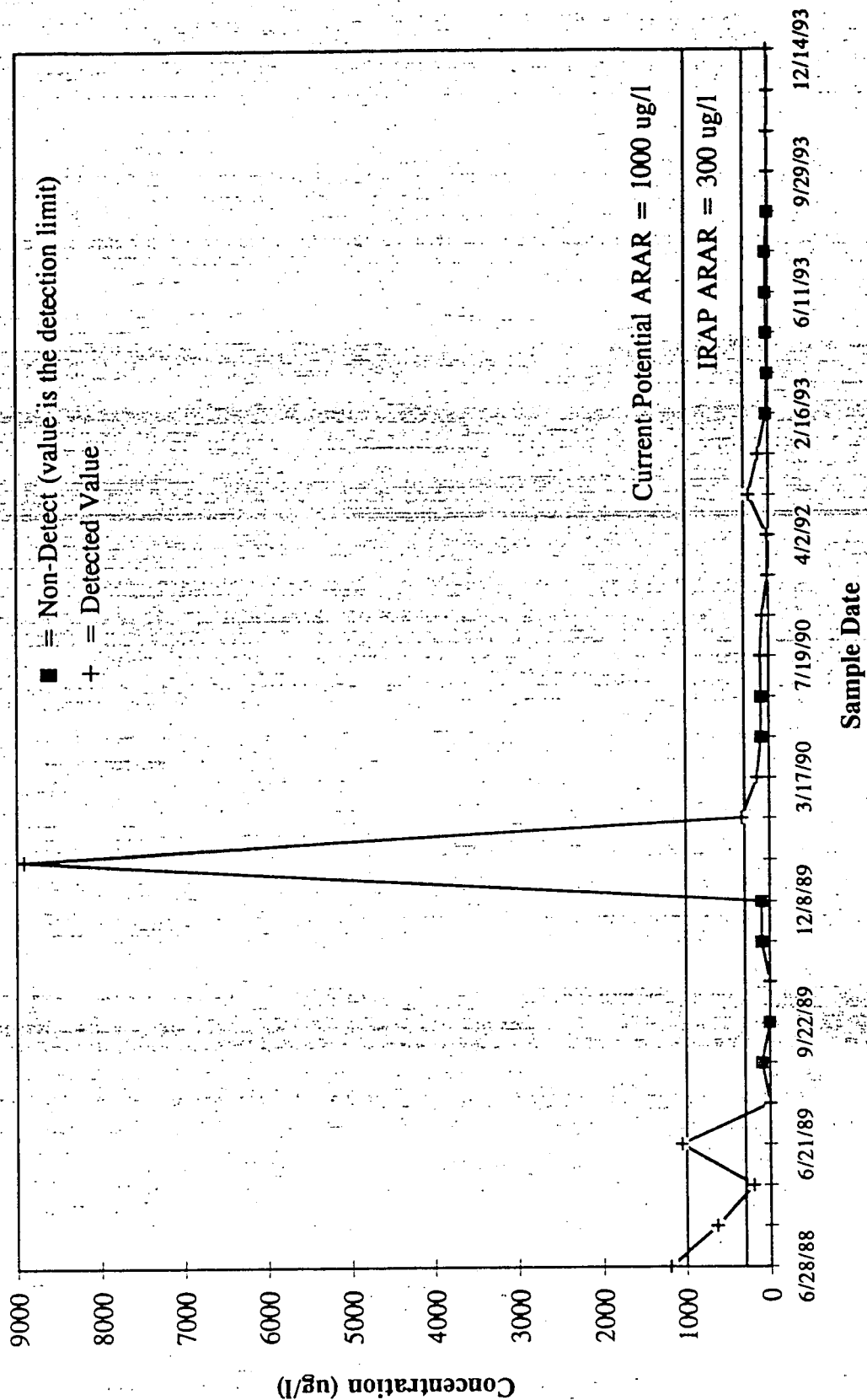
Mercury concentrations exceeded only the current potential ARAR more than 5% of the time. The current potential ARAR for mercury is 0.01  $\mu\text{g}/\ell$ . Figure 2-8 illustrates concentration vs. time for the mercury data.

Considering the complete data set, mercury exceeded the potential current ARAR in only 2 of the 28 samples, which are the only two detections of mercury. The two values are 0.7 and 700  $\mu\text{g}/\ell$ , and review of Figure 2-8 indicates the 700  $\mu\text{g}/\ell$  value is an outlier. Of the samples collected after January 1990, mercury was not detected.

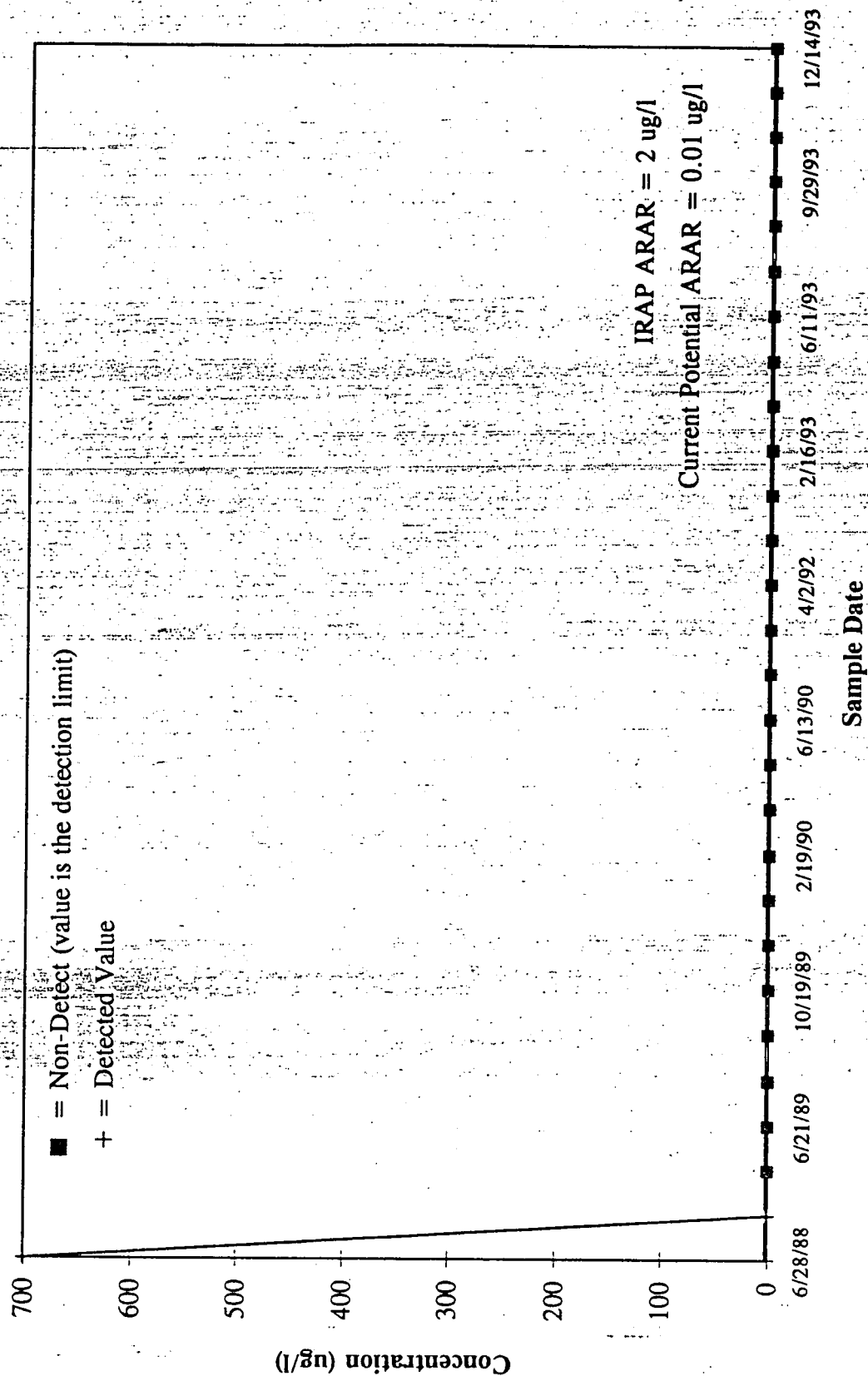
#### 2.2.3.6 Silver

Silver concentrations exceeded only the current potential ARAR more than 5% of the time. The current potential ARAR for silver is 0.36  $\mu\text{g}/\ell$ . Figure 2-9 illustrates concentration vs. time for the silver data.

Figure 2-7  
Iron Concentrations Over Time  
Building 881 Footing Drain



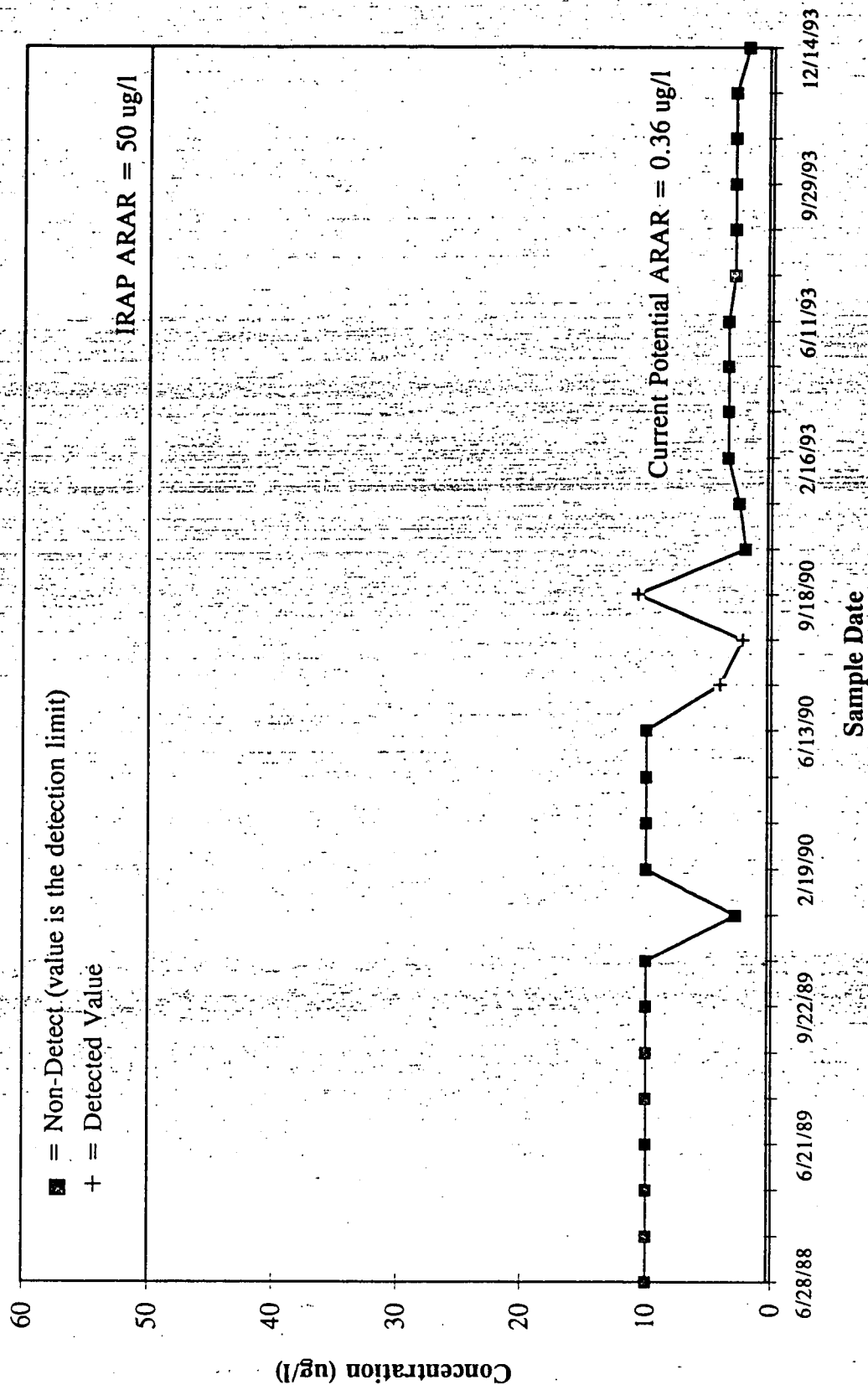
**Figure 2-8**  
**Mercury Concentrations Over Time**  
 Building 881 Footing Drain



16/18



**Figure 2-9**  
**Silver Concentrations Over Time**  
 Building 881 Footing Drain



17/18

Considering the complete data set, silver exceeded the current potential ARAR in only 3 of the 28 samples. The three exceedances are the only detections of silver and they ranged from 2.3 to 10.7  $\mu\text{g}/\ell$ . Of the 12 samples collected after January 1990, silver was not detected.

#### 2.2.3.7 Zinc

Zinc concentrations exceeded only the current potential ARAR more than 5 % of the time. The current potential ARAR for zinc is 113  $\mu\text{g}/\ell$ . Figure 2-10 illustrates concentration vs. time for the zinc data.

Considering the complete data set, zinc exceeded the current potential ARAR in only 3 of the 31 samples. The values exceeding ARAR ranged from 116 to 277  $\mu\text{g}/\ell$ , and the calculated mean for the entire data set was only 59.1  $\mu\text{g}/\ell$ , which is below ARAR.

#### 2.2.4 Radionuclides

None of the radionuclides exceeded the IRAP ARARs and only two radionuclides exceed the current potential ARARs: americium<sup>241</sup> and total uranium (Table 2-4). Although gross alpha and beta exceed their current potential ARARs greater than 5 % of the time, gross alpha and beta are only overall measures of radionuclide activity. As with the metals cited in Section 2.2.3, the OU1 RFI/RI has determined that radionuclides are not contaminants of groundwater at OU1. Therefore, gross alpha and beta activity resulting from radionuclides that are not contaminants appears to be relevant to ARAR compliance. Even though radionuclides are not contaminants in OU1 groundwater, a more detailed analysis of the americium and uranium data is presented in the following subsections.

##### 2.2.4.1 Americium

Americium concentrations exceeded only the current potential ARAR more than 5 % of the time. The current potential ARAR for americium is 0.05 pCi/ $\ell$ . Figure 2-11 illustrates concentration vs. time for the americium data.